

Lec : 12 Expert Systems.

Ordering

→ Expert System

Computer Software that

- emulates human expert
- Use human Knowledge to solve problems that normally would require human intelligence.
- Deals with small, well defined domains of expertise
- Is able to solve real-world problems.
- Is able to act as a cost-effective consultant
- Can explain reasoning behind any solutions it finds
- Should be able to learn from experience.

→ An Expert System is a system that employs human knowledge captured in a computer to solve problems that ordinarily require human expertise.

→ Expert Systems manipulate knowledge while conventional programs manipulate data.

→ An expert system is often defined by its structure.

→ Knowledge Based System & Expert System

* Knowledge Based System : Computer software that depends on large database gives output of an input according to stored data → There is no conclusion استنتاج

* Expert Systems Development (ESALifecycle)

مراحل عمل أنظمة خبيرة

1. Problem Definition

→ explain the problem and collect all data about it (analysis)

2. System Design

(Knowledge acquisitions)

3. Formalization

(Logical design, L., tree structures)

4. System Implementation

(building a prototype)

5. System Validation.

(test your system)

* Characteristics Of an Expert System.

- Expertise
- Symbolic Reasoning
- Depth
- Self Knowledge.

→ How Conclusions are made ?

1] Goal Driven Reasoning (backward chaining)

an inference technique which uses IF THEN rules to repetitively break a goal into smaller subgoals (to reach initial data) which are easier to prove.

2] Data Driven Reasoning (Forward Chaining)

an inference technique which uses IF THEN rules to deduce a problem solution from initial data (to goal)

Note : Here the System must initially populated with data

→ Expert System Ability

[1] Uncertainty: The ability of the system to reason with rules and data which are not precisely known.

→ System can give us information about degree of uncertainty in the knowledge or data stored in system.

[2] Explanations: The ability of the system to explain the reasoning process that it used to reach a recommendation.

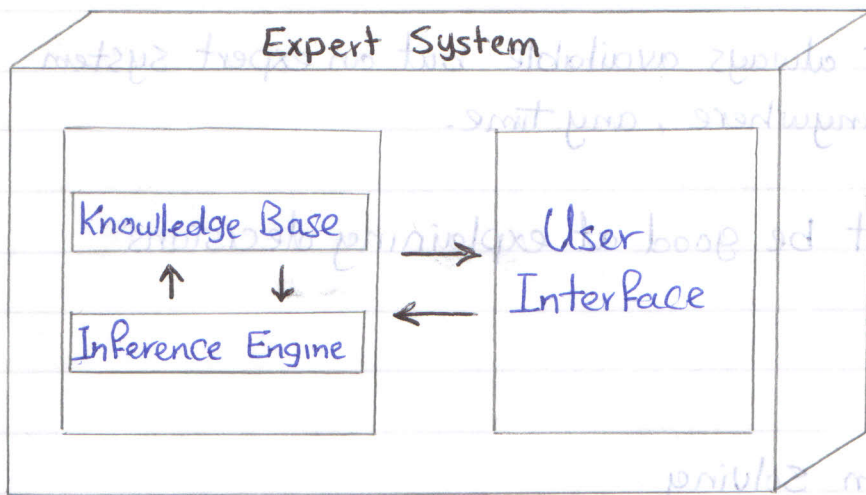
→ System can give us explanation of conclusions.

→ System knows which rules were used during the inference process.

[3] User Interface: That portion of the code which creates an easy way to use the system.

[4] Data Representation: The way in which the problem specific data in the system is stored and accessed.

* Expert System Components.



1. The Knowledge Base:

Is the collection of Facts and rules which describe all the Knowledge about the problem domain.
(we get it from experts)

2. The Inference Engine:

Is the part of the System that chooses which Facts and rules to apply when trying to solve the user's query.

3. The User Interface:

Is the part of the System which takes in the user's query in a readable form and passes it to the inference engine. It then displays the results to the user.

* Advantages

- Experts are not always available but an expert system can be used anywhere, any time.
- Experts may not be good at explaining decisions
- Cost effective
- Superior problem solving
- Reliability : Human experts are not 100% reliable or consistent
- Work with incomplete information
- Transfer of Knowledge.

* Disadvantages

- High development costs
- Can not learn from experience
- Not all problems are suitable
- limited domain
- Systems are not always up to date, and don't learn
- No "Common Sense"
- Experts needed to setup and maintain system

* Creating an Expert System

Two Steps

1. Knowledge acquisition: Extracting Knowledge and methods from the experts.
2. Knowledge representation: Reforming Knowledge / methods into an organised form.

* What is Knowledge?

- Data : Raw Facts , Figures , measurements
- Information : Refinement and use of data to answer specific questions.
- Knowledge : Refined information.

* Sources of Knowledge

① Documented

- . books , journals , procedures
- . Films , databases

② Undocumented

- . people's Knowledge and expertise
- . people's minds , other senses

* Type of Knowledge

- Facts ex: dogs , teeth , carnivore
- Relations ex: mother of Paul
- Rules ex: IF breathing > 20 then hyperventilating
- Concepts ex: For All X & Y
- Procedures ex: Do this then that

Show the lecture 12 From slide 31 to 46